Notes on the Nesting Site of *Centris derasa*

(Hymenoptera : Apoidea)

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In June 1962 Mr. S. Ramsumair, Entomology Department, University of the West Indies, mentioned that on several occasions he had found larvae and pupae of a large bee in the nests of an arboreal termite. In his company I opened a few termite nests in which we found several empty cells of the same type from which he had obtained his specimens. During the next few months I opened several nests and arranged to have my assistant, Mr. D. Bharath, open additional ones. Although many nests contained old empty cells, it was not until October that a cell containing a living larva was found. Attempts to rear larvae from opened cells were unsuccessful and, although 50 undisturbed termite nests were patrolled at weekly intervals for several weeks, no sign of bee activity was noted until 28 December when Mr. Bharath found a termite nest from which the abdomen of a bee protruded. The bee was dead and had been attached firmly to the nest by the termites. It had been dead for only a day or so as the abdomen was still flexible. Although damaged considerably when removing it from the nest, it proved to be the same species as two females caught in October around the yellow flowers of *Cassia multijuga*. These specimens were subsequently identified by specialists at the Commonwealth Institute of Entomology as *Centris derasa* Lepeletier. Termites from several of the nests were determined as *Microcerotermes arboreus* Emerson by Mr. W. E. Harris. A description and illustration of the nest of this species have been provided by Adamson (1937). An additional female captured later in its tunnel within a termite nest was also determined as *Centris derasa* by Padre Jesus S. Moure, C. M. F., Universidad do Paraná, Curitiba, Brazil.

Records were kept on the termite nests opened during the period September 1962 through May 1963 and the number containing cells, the total number of cells, the nest with the largest number of cells, and the cells containing immature stages being noted. This information is summarized in Table 1. As large termite nests may be several years of age, cells constructed throughout this period were present and recognizable. For example, the nest containing the greatest number of *Centris* cells (150) was very large and possibly more than 5 years old. Although the cells may be occupied by the termites after the emergence of the bees, the cell walls remain more or less intact and are readily recognizable when a nest is dismantled. The number of provisioned cells found during dissection

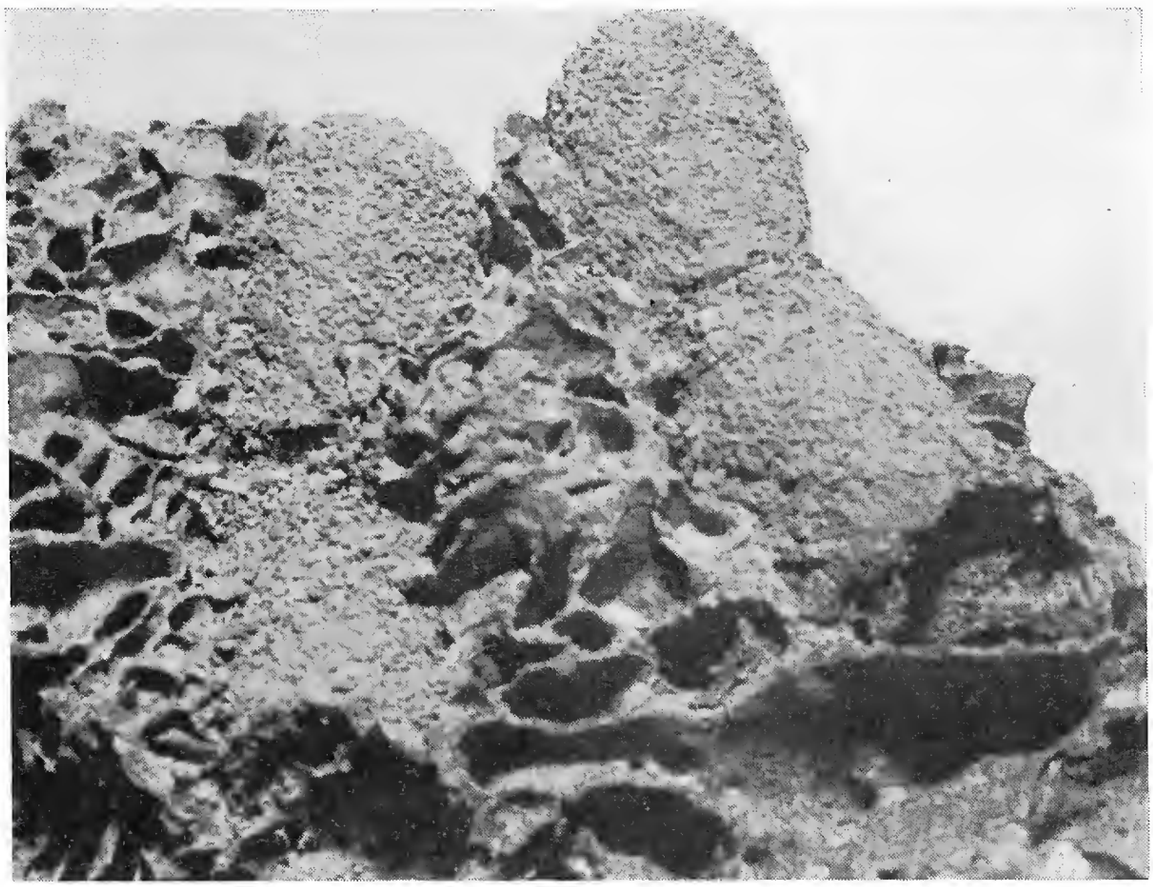
Table 1. Summary of termite nests examined for stages of *Centris derasa*, September 1962 through May 1963.

Month		No. of Nests Examined	No. of Nests with Cells	Total Cells	Largest No. of Cells in One Nest	Living Stages
1962	September	48	21	124	12	—
	October	40	25	174	48	1 larva
	November	138	86	1,101	150	1 larva
	December	86	56	432	34	1 dead adult 3 provisioned cells
1963	January	71	25	588	34	—
	February	117	53	303	16	1 dead adult 4 provisioned cells 1 live adult
	March	82	31	166	26	1 dead adult
	April	94	28	145	22	—
	May	54	13	64	16	4 provisioned cells

of the nests was disappointingly small, and attempts to rear adults from these were unsuccessful. It is believed that many of the cells after being provisioned and sealed off were invaded by the termites, resulting in the death of the developing bee.

As the cells are found in sections of the nests in which the termites are active, it is apparent that the female bee tunnels into the nest in the presence of the termites, often to a depth of 4 to 6 inches. Because of termite activities, the bee obviously must work quickly to construct, provision, and seal each cell before it is invaded by the termites. From two to five cells lying end to end are present in each series of cells. In a few nests a second tunnel branching from the same entrance hole has been found, but in most nests the position of the different series would indicate the construction of a separate entrance hole for each.

The cells are elongate (length 22–24 mm) circular in cross section, broadest near the lower end (diameter 15 mm) and tapering gradually to the upper end (diameter 11 mm). The upper end is closed with a flat cap, whereas the lower end may be flattened or rounded externally but is always rounded internally. Each cell consists of an outer layer presumably constructed mainly of mud obtained from the termite nest and a smooth, dark inner layer approximately 0.2 mm in thickness apparently constructed of a mixture of mud and wax. This layer is impermeable to water. The full-grown larva prior to pupation lines the cell with a thin,



Explanation of Figure

Fig. 1. Section of nest of *Microcerotermes arboreus* containing four cells of *Centris derasa*.

golden, papery cocoon. A section of the nest with four cells is shown in Fig. 1.

Although attempts to rear adults from larvae obtained from cells were unsuccessful, one partially grown larva removed with the pollen mass from the same cell and placed in a paper-lined glass vial of slightly larger diameter than the cell completed its feeding, lined the vial with the golden papery cocoon, and pupated but died in the late pupal stage. Two full-grown larvae pupated in similar containers but also failed to attain the imago stage.

No published records of other nesting sites of *Centris derasa* have been noted nor have there been any records of other species of the genus inhabiting termite nests. It cannot be definitely stated, therefore, that *Centris derasa* does not at times also construct cells in the soil as do many other species of the genus, but evidence to date indicates that nests of *Microcerotermes arboreus* Emerson are the only sites utilized.

The evolution of the peculiar habit of utilizing termite nests can only be surmised. As many species of *Centris* do nest in the ground, certain species at a depth of several feet in compact soil, little adaption is needed

for the construction of tunnels in nests of those species of termites which are constructed of earth or mud apart from the ability to work in the presence of termites and to construct, provision, and seal cells which are resistant to termite attack. As *M. arboreus* at times constructs nests at ground level, it is conceivable that in an earlier evolutionary period during a series of very wet years when the ground was too waterlogged for the construction of nests in the soil the bees started to utilize abandoned termite nests near ground level. From this it would then be a short step to the utilization of occupied nests several feet above the ground, particularly as tunnels are constructed quite rapidly, probably in the space of one day, and in the event of partial blockage by the termites during the night they could very quickly be reopened the following day. Similarly, once a cell has been constructed it is probably provisioned and sealed during the same day.

Literature Cited

Adamson, A. M. 1937. Preliminary report on termites and termite damage in Trinidad, West Indies. Trop. Agric., 14: 141–149.

Trichoptera of Baja California

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Several collections of Trichoptera from Baja California have recently been made by members of the California Academy of Sciences and the University of California. These collections have largely been responsible for almost doubling the known trichopterous fauna of Baja California. Of particular interest are three new species which are herein described.

To date the majority of Trichoptera from Baja California are also known from the western United States and western Mexico. Future collecting should determine if the new species are endemic species; it is probable that only *Atopsyche hintoni*, n. sp., is confined to the peninsula.

In January 1959, H. B. Leech, California Academy of Sciences, collected one larva and several pupae of a rhyacophilid in a stream near Miraflores, Baja California. The stream is subject to rapid torrents following tropical storms and is considerably scarred. The stream bed contains large boulders and at the time of collecting contained deep pools of water. Mr. Leech states, "I collected chiefly in various shallow pools with sandy shores and bottoms, and in the stream joining them." A mature male was dissected from one pupal case and the new *Atopsyche* described herein is based on that male.